

Designer's Check List for Prestressed Concrete

Design	Reference/Commentary
<p>Prestressing Force:</p> <p>An estimate of prestress force required can be made from charts in Section 11 of the <i>Bridge Design Aids</i> (BDA) manual.</p> <p>Call for P_{jack} at anchorages for cast-in-place structures.</p> <p>Call for P_f at centerline of span for precast units</p>	<p><i>Bridge Design Aids</i>, Section 11</p> <p>Give precastor flexibility in strand layout</p>
<p>One-end stressing of post-tensioned structures:</p> <p>Stress simple spans from either end.</p> <p>All two-span post-tensioned structures shall be designed for stressing from the long-span end only. Use the following note on the plans:</p> <p>“One-end stressing shall be performed from the long-span end.”</p> <p>Multi-span structures and structures involving hinges should be checked for one-end stressing. One-end stressing is considered economical when the increase in P_{jack} does not exceed 3 percent. If one-end stressing is permitted, the plans must show the location where one-end stressing is to be performed.</p>	<p>Based on studies conducted in 1971</p>

Supersedes Memo to Designers 11-3 dated August 1989

Loss of Prestress:

The effect of horizontal curvature is to be considered when determining prestress losses.

Losses other than friction: See *Bridge Design Specifications*, Table 9.16.2.2.

Concrete Strength:

For post-tensioning, minimum f'_c is 4,000 psi and minimum f'_{ci} is 3,500 psi.

For pretensioning, minimum f'_c or f'_{ci} is 4,000 psi.

For cast-in-place construction, show required f'_c to the nearest 500 psi for strengths to 5,500 psi and to the nearest 100 psi for higher strengths. Show f'_{ci} to the nearest 100 psi for all strengths.

Miscellaneous:

Flare exterior girders to 18" minimum at anchorages.

The flare length of 16' and #4 duct ties shown on Standard Plan B8-5 are the minimum values to be used. We have had several unsatisfactory experiences with details that incorporated shorter flares and duct ties of a different configuration.

Reinforce ends of anchorage diaphragms for bursting forces.

Consider effects of lateral tendon force on horizontally curved prestressed structures.

Use a factor of three (3) for effects of creep when determining camber for cast-in-place box girder structures.

Refer to Memo to Designers 11-34 for cambering hinge spans.

Reference/Commentary

Memo to Designers 11-30

Memo to Designers 11-8;
Standard Specifications 50-1.08;
Bridge Design Specifications, Table 9.16.2.2

Memo to Designers 11-8

Memo to Designers 11-31

Memo to Designers 11-34

Miscellaneous, continued

Consider effects of end rotation at end of long span precast girders.

Provide for shortening during stressing. Use greased sheet metal on top of elastomeric pads.

Since prestressed structures continue to shorten, use less than conventional thickness of expansion joint filler.

Keep C.G. at anchorages as low as possible to avoid conflict with the joint seal installation. If possible, and it usually is, show a ± 6 " tolerance for the C.G. at the anchorages.

Check for special design requirements for SPT Co. railroad structures.

Prestressing duct patterns for SPT Co.

Reference/Commentary

Account for semi-rigid connection due to prior pouring of intermediate and end diaphragms

Memo to Designers 7-1

Memo to Designers 17-120

Memo to Designers 17-140

Detailing

#8 bars are used in top of web as in reinforced box.

Do not define the type of duct on the plans.

It is not necessary to show vent details for ducts.

Precast girders: Required intermediate and end diaphragms shall be placed at least 5 days before deck.

Provide minimum stirrups of 8 @ 12" at all supports and anchor ends.

Show concrete strength limits. See *Bridge Design Details*, pages 9-22 and 9-23.

Std. Plan B7-1
"Buck Winter" bars for excessive falsework settlement

Standard Specifications 50-1.07

Std. Plan BO-5, Deck Placing Notes

Bridge Design Details, p. 14-12

Bridge Design Details, pp. 9-22 & 9-23

Detailing, *continued*

Curved girder reinforcing. See Memo to Designers 11-30.

Prestressing Notes – Cast-In-Place Girders

Prestressed I-Girder Stirrup Anchorage

Camber Diagram – Suggest using BDS plot command to produce camber diagram.

For cast-in-place prestressed girder spans involving hinges, place a note near camber diagram giving reaction at the hinge for the suspended span under full dead load plus initial prestress force.

For simple span structures provide a minimum upward camber of 0.01 ft. per 10 ft. of span length.

Path of center of gravity of prestressing force.

Reference/Commentary

Memo to Designers 11-30;
Bridge Design Details, p. 1-17.1

Bridge Design Details, p. 1-17.1
Bridge Design Details, p. 9-21.3

Bridge Design Details, p. 14-15

Bridge Design Details, pp. 9-21.2 & 14-13

Aids construction in falsework calculations

Bridge Design Details, p. 9-21 & 9-21.1

Estimating

Method of calculating weight of prestressing steel — ignore weight of anchorages.

Estimate girder stems as having no flare unless extra width is specifically dimensioned.

Bridge Design Aids, p. 11-72



Shop Plans

Read Memo to Designers 11-1, Special Provisions and Standard Specifications.

Anchorage must be tested and approved by Transportation Laboratory. If in doubt contact Prestress Committee.

Advise Documents Unit if more than one RR is involved.

Allowable variation of force between adjacent girders in ratio of 3 to 2. Maximum variation 725 kips.

Reference/Commentary

Memo to Designers 11-1;
Standard Specifications, Section 50

Standard Specifications 50-1.06

Memo to Designers 11-1


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11-3 DESIGNER'S CHECK LIST FOR PRESTRESSED CONCRETE

Design

Reference/Commentary

Prestressing Force:

An estimate of prestress force required can be made from charts in Section 11 of the *Bridge Design Aids* (BDA) manual.

Bridge Design Aids,
Section 11

Call for P_{jack} at anchorages for cast-in-place structures.

Call for P_f at centerline of span for precast units

Give precastor flexibility
in strand layout.

One-end stressing of post-tensioned structures:

Stress simple spans from either end.

All two-span post-tensioned structures shall be designed for stressing from the long-span end only. Use the following note on the plans:

"One-end stressing shall be performed
from the long-span end."

Multi-span structures and structures involving hinges should be checked for one-end stressing. One-end stressing is considered economical when the increase in P_{jack} does not exceed 3 percent. If one-end stressing is permitted, the plans must show the location where one-end stressing is to be performed.

Based on studies
conducted in 1971

Loss of Prestress:

The effect of horizontal curvature is to be considered when determining prestress losses.

Memo to Designers 11-30

Losses other than friction: See *Bridge Design Specifications*, Table 9.16.2.2.

Memo to Designers 11-8;
Standard Specifications
50-1.08; *Bridge Design*
Specifications, Table
9.16.2.2

Memo converted to metric.

Concrete Strength:

For post-tensioning, minimum f'_c is 28 MPa and minimum f'_{ci} is 25 MPa.

For pretensioning, minimum f'_c or f'_{ci} is 28 MPa.

For cast-in-place construction, show required f'_c to the nearest 3 MPa for strengths to 40 MPa and in increments of 1 MPa above 40 MPa. Show f'_{ci} to the nearest 1 MPa for all strengths.

Reference/Commentary

Memo to Designers 11-8

Miscellaneous:

Flare exterior girders to 450 mm minimum at anchorages.

The flare length of 5 m and duct ties shown on Standard Plan B8-5 are the minimum values to be used. We have had several unsatisfactory experiences with details that incorporated shorter flares and duct ties of a different configuration.

Reinforce ends of anchorage diaphragms for bursting forces.

Consider effects of lateral tendon force on horizontally curved prestressed structures.

Memo to Designers 11-31

Use a factor of three (3) for effects of creep when determining camber for cast-in-place box girder structures.

Refer to Memo to Designers 11-34 for cambering hinge spans.

Memo to Designers 11-34

Consider effects of end rotation at end of long span precast girders.

Account for semi-rigid connection due to prior pouring of intermediate and end diaphragms.

Provide for shortening during stressing. Use greased sheet metal on top of elastomeric pads.

Memo to Designers 7-1

Since prestressed structures continue to shorten, use less than conventional thickness of expansion joint filler.

Keep C.G. at anchorages as low as possible to avoid conflict with the joint seal installation. If possible, and it usually is, show a ± 150 mm tolerance for the C.G. at the anchorages.

Check for special design requirements for SPT Co. railroad structures.

Memo to Designers 17-120

Prestressing duct patterns for SPT Co.

Memo to Designers 17-140

Detailing

#25 bars are used in top of web as in reinforced box.

Do not define the type of duct on the plans.

It is not necessary to show vent details for ducts.

Precast girders: Required intermediate and end diaphragms shall be placed at least 5 days before deck.

Provide minimum stirrups of 8 @ 300 mm at all supports and anchor ends.

Show concrete strength limits. See *Bridge Design Details*, pages 9-22 and 9-23.

Curved girder reinforcing. See Memo to Designers 11-30.

Prestressing Notes – Cast-In-Place Girders

Prestressed I-Girder Stirrup Anchorage

Camber Diagram – Suggest using BDS plot command to produce camber diagram.

For cast-in-place prestressed girder spans involving hinges, place a note near camber diagram giving reaction at the hinge for the suspended span under full dead load plus initial prestress force.

For simple span structures provide a minimum upward camber of 1 mm per meter of span length.

Path of center of gravity of prestressing force.

Reference/Commentary

Std. Plan B7-1, "Buck Winter" bars for excessive falsework settlement.

Standard Specifications
50-1.07

Std. Plan BO-5, Deck
Placing Notes

Bridge Design Details,
p. 14-12

Bridge Design Details,
pp. 9-22 & 9-23

Memo to Designers
11-30; *Bridge Design
Details*, p. 1-17.1

Bridge Design Details,
pp. 1-17.1 & 9-21.3

Bridge Design Details,
p. 14-15

Bridge Design Details,
pp. 9-21.2 & 14-13

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falsework calculations.

Bridge Design Details,
p. 9-21 & 9-21.1

Estimating

Method of calculating weight of prestressing steel — ignore weight of anchorages.

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Reference/Commentary

Bridge Design Aids,
p. 11-72

Shop Plans

Read Memo to Designers 11-1, Special Provisions and Standard Specifications.

Memo to Designers 11-1;
Standard Specifications,
Section 50

Anchorage must be tested and approved by Transportation Laboratory. If in doubt contact Prestress Committee.

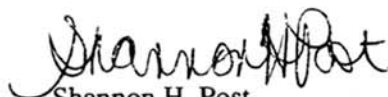
Standard Specifications
50-1.06

Advise Documents Unit if more than one RR is involved.

Allowable variation of force between adjacent girders in ratio of 3 to 2. Maximum variation 3200 kN.

Memo to Designers 11-1


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